UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/059,292 | 01/31/2002 | Jerome Maillot | 1252.1053 | 7151 |

21171 7590 02/02/2004

STAAS & HALSEY LLP
SUITE 700
1201 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

| EXAMINER | |
|---|---|
| LEHNER, WILLIAM P | |
| **ART UNIT** | **PAPER NUMBER** |
| 2671 | 4 |

DATE MAILED: 02/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/059,292 | MAILLOT ET AL. | |
| | Examiner | Art Unit | |
| | William P Lehner | 2671 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) 1-24 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-24 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 21 May 2002 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. §§ 119 and 120**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.

4) ☐ Interview Summary (PTO-413) Paper No(s). _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

## DETAILED ACTION

### Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 24 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 24, lines 2-4 recite the limitation `The tessellation has a fineness, according to the size of the triangles, that is sufficient to represent the surface, but not sufficient to represent detail in a displacement map.` There is insufficient antecedent basis for this limitation in the claim. It is unclear what "sufficient" means.

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claim 24 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 24, lines 2-4 recite the limitation `The tessellation has a fineness, according to the size of the triangles, that is sufficient to represent the surface, but not sufficient to represent detail in`

a displacement map. The specification does not explain why the fineness is sufficient to represent the surface, but insufficient to represent detail in the displacement map.

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-3, 7-12, and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Migdal (5886702).

3. In regard to claim 1, A method of defining a surface of a model, Migdal defines the surface of a model (column 2, lines 15-20). Comprising: determining automatically an area of detail corresponding to an area of the model by referring to a displacement map; Figure 3a-h shows a displacement map containing points displaced at different distances from a surface (column 9, lines 19-28). The area of detail is the points above the surface 110 shown in the displacement map (FIG 3). The first step is to find the basic contours of this area (column 9, lines 4-6) using the displacement map (FIG3 a and b). In regard to the limitation "automatically," software rapidly builds the mesh and then checks to add points (column 4, lines 29-54). And increasing automatically a resolution of the area of the model by increasing a number of polygons representing the area. The resolution is increased by adding more points (column 9, lines 6-12). These inserted points are the vertices of triangles (column 5,

lines 28-34). This process automatically continues until the tolerance level is met (column 10, lines 27-34 and FIG 3 a-h).

4. In regard to claim 2, The method according to claim 1, wherein the referring comprises obtaining detail information from the displacement map. Migdal's method obtains the distance along a normal vector from a point to the relevant face or surface. The farthest point is added to the mesh (column 9, lines 43-51). Distance is the detail information and is obtained from the displacement map (FIG 3a elements 112 and 113, and FIG 3b element 118).

5. In regard to claim 3, The method according to claim 2, wherein said determining further comprises basing said determining on the detail information. The next point added furthest point from the face, which is based on the distance (column 9, lines 43-51).

6. In regard to claim 7, The method according to claim 1, wherein said increasing further comprises preferentially connecting vertices of the polygons along one of edges and borders that are in the area of detail. The vertices of the displacement map are preferentially connected to form faces according to their height (FIG 3). The inserted face becomes one edge of a triangle in the mesh (column 5, lines 28-34).

7. In regard to claim 8, The method according to claim 1, wherein the polygons are triangles and wherein vertices of the triangles are feature points. These inserted vertices of triangles are optimal feature points (column 5, lines 28-47).

8. In regard to claim 9, The method according to claim 1, wherein the model is a polygon mesh model. Note the polygon mesh model (FIG 2e).

9. In regard to claim 10, A method of creating a surface comprising automatically refining a representation of a surface by automatically determining one of a location and a direction of a feature corresponding to the surface. This process of refining the resolution automatically continues until the tolerance level is met (column 10, lines 27-

34 and FIG 3 a-h). Migdal finds the location of the inserted point and the direction of the inserted face (FIG 3).

10. In regard to claim 11, A method of creating a model, comprising: identifying automatically areas of one of details and features that correspond to areas of the model; and increasing representation of the model in areas of the model corresponding to the areas of detail. Migdal automatically identifies the area of detail and features above the surface or face of the model and increases the resolution (FIG 3). Also, see the above remarks directed to claim 1.

11. In regard to claim 12, A method of obtaining a surface, comprising automatically deriving information of features of a displacement map to automatically locate points used to represent the surface. Migdal automatically derives the displacement of distance from the feature point to the surface, locates the farthest point, and inserts this point into the mesh that represents the surface.

12. In regard to claim 18, A method of displacing a surface, comprising: identifying features of a displacement map, the features including locations and directions of detail in the displacement map; Figure 3 shows a displaced surface. The locations of feature points and the direction of the faces that they form are determined by the displacement map. Adjusting points corresponding to the surface, based on the features of the displacement map; Points are inserted based on the height values in the displacement map. Newly inserted points cause adjustments to be made in the mesh (column 16, lines 47-49 and FIG 3). Identifying borders of features in the displacement map; Each edge in the displacement map is a feature border (FIG 3). And deriving a displaced surface mesh by using the borders to constrain a triangulation of the adjusted points. These borders are used to constrain a triangulation of the adjusted points (column 4, lines 31-48).

### *Claim Rejections - 35 USC § 103*

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

14. Claims 4-6, 13-17, and 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Migdal (5886702) in view of Peterson (5428718).

15. In regard to claim 4, `The method according to claim 1, wherein said increasing comprises: sampling the area of detail;` The points in the area of detail are sampled for their distance (Migdal, column 9, lines 43-51), `and adding a vertex at a sample point when the point has a substantially non-zero feature metric.` Applicant says that a feature metric approximates an amount of local curvature in the height field in a local area of the point (page 4, lines 17-18). Migdal's added points are in locations of significant local curvature in the height field (Migdal, FIG 3c elements 102, 103, and 104), but the reference does not explain this. These locations have significant local curvature because the added points are located at a farther distance from the relevant face than their neighboring points. Neighbors on both sides will always have a shorter height. This process continues until the tolerance level is met (Migdal, column 10, lines 27-34 and FIG 3 a-h).

16. Migdal does not say that these locations have non-zero feature metrics or high local curvature. Peterson teaches that more points should be placed in the areas of maximum curvature (column 7, line 50 – column 8, line 8) because this better represents the curves. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Migdal to add vertices when the

sample point has a non-zero feature as taught by Peterson because this better represents the curves.

17. In regard to claim 5, The method according to claim 1, wherein said increasing further comprises moving the sample point toward a direction of a high rate of change. Migdal moves the sample point from all eligible sample points to sample point 104 (Migdal, FIGs 3b and 3c) because this is the sample point with the farthest distance to a face (Migdal, column 9, lines 43-51). This location has a high rate of change because it has the farthest distance to the face than all of its neighboring points.

18. Migdal does not say that this location has a high rate of change. Peterson teaches adding points at these locations which have a change in tangency and an abrupt change in slope because multiple segments are needed (Peterson, column 8, lines 9-19). An abrupt change in slope has the same meaning as a high rate of change. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Migdal to move the sample point toward a point with a high rate of change as taught by Peterson because multiple segments are needed.

19. In regard to claim 6, The method according to claim 1, wherein said increasing further comprises adding vertices at points of significant curvature. Migdal adds vertices at points of significant curvature but does not say so. Peterson teaches Migdal to add vertices at these points to better represent the curves (Note the above rejection to claim 4).

20. In regard to claim 13, A method of displacing a parameterized surface comprised of two-dimensional subdivisions, Migdal does not say that he uses a parameterized surface comprised of two-dimensional subdivisions.

Peterson teaches a parameterized surface comprised of two-dimensional subpatches because this allows the use of B-spline functions and because discontinuities 230 occur at subpatch boundaries (Peterson, column 3, lines 33-53 and FIGs 2a and 2b). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Migdal to have a parameterized surface comprised of two-dimensional subdivisions as taught by Peterson because it allows the use of B-spline functions and because discontinuities occur at subdivision boundaries.

21. `The method comprising: generating two-dimensional height maps for subdivisions of the surface by sampling a height field to calculate a height value for points in the subdivision;` Migdal generates a 2-D height map (FIG 3) containing the height of points above an area of a surface, and Peterson teaches using subdivisions as this area. `And generating two-dimensional feature maps, for the subdivisions, that identify features of the height field,` Migdal generates faces (FIG 3b, elements A, B, and C) that correspond to a 3-D feature map over an area that identify features of the heights.

22. `By using the height map and height field to calculate approximate degrees and directions of local curvature.` Migdal does not use the height field to calculate degrees and directions of local curvature. Peterson teaches calculating the degree of local curvature in the u and v directions (column 7, lines 58-62) because this determines where to place vertices. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to

modify Migdal to calculate the direction and degree of local curvature as taught by Peterson because this determines where to place vertices.

23. In regard to claim 14, A method of creating a surface, comprising: approximating a surface with a point; computing a height of the point and heights in a local neighborhood of the point; Migdal approximates the surface with a point and computes the height of points in the local neighborhood (FIG 3). And see the above remarks directed to claim 1.

24. Deriving information of local change in the heights; determining whether the information of local change indicates that the local neighborhood is substantially flat; and representing the surface without the point when said determining indicates a substantially flat local area. Migdal does not place points where the local area is substantially flat (FIG 3c elements 105-108), where 'substantially' is defined by the tolerance (column 10, lines 27-34). Midgal does not measure the local change in heights. Peterson teaches measuring a change in height above a surface and represents the surface with less points where it is relatively flat (column 7, lines 53-66) because vertices are needed at breaks in continuity, not within segments (column 8, lines 9-19). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Migdal to determine information of local change indicates a flat surface and represent substantially flat areas without points as taught by Peterson because vertices are needed at breaks in continuity, not within segments.

25. In regard to claim 15, A method of creating a surface, comprising: approximating a surface with a point; computing a height of the point and heights of a local neighborhood of the point; deriving information of local change in the heights; determining whether the information of local change indicates that the point is a feature point of the neighborhood; and representing the surface with the point when said determining indicates it is a feature point. Feature points are vertices along contours of the polygon mesh. Claim 15 is rejected for the same reasons as claim 14.

26. In regard to claim 16, The method according to claim 15, further comprising using the heights to approximate a gradient for the point if it has been determined to indicate local change, and repositioning the point to a location in the direction of the gradient. Midgal does not approximate a gradient. Peterson teaches adding points at locations which have a change in tangency and an abrupt change in slope because multiple segments are needed at these breaks in continuity (Peterson, column 8, lines 9-19). Slope has the same basic meaning as gradient (i.e., a rate of change). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Migdal to move the sample point toward a point on a gradient with local change as taught by Peterson because multiple segments are needed at breaks in continuity.

27. In regard to claim 17, The method according to claim 16, further comprising adding a new point in the neighborhood at an extrema in the neighborhood in the direction of the gradient. Midgal adds points in locations of local extrema- where the curve reaches a minimum or maximum locally (FIG 3c, elements 102, 103, and 104).

28. In regard to claim 19, A method of displacing a surface, comprising: deriving a set of points for triangles in a tessellation of the surface, by creating a distribution of points on and in a triangle, calculating height values for points in the distribution by sampling a height field, Migdal creates a set of points for triangles in a tessellation of the surface (FIG 8b). There are points on triangles at the vertices where triangles meet, and also points within a triangle (FIG 8b, elements 314 and 326). The distance between a surface and points within triangles is the height value (FIG 8b, elements 320, 324, and 328).

29. Calculating a feature metric for points in the distribution by approximating second derivatives of the points using height values of neighboring points in the distribution, and eliminating points from the distribution that have feature metrics indicating a locally flattish region of the height field. Migdal does not calculate a second derivative. Peterson teaches using the local points to calculate a second derivative, to place points in these areas, and not to place points where the local surface is relatively flat (Peterson, column 7, lines 50-66) because segments are needed where there is a break in continuity (Peterson, column 8, lines 9-17). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Migdal to calculate a second derivative using the height value of neighboring points and to not place points in flat area as taught by Peterson because vertices are needed between segments where there is a break in continuity.

30. In regard to claim 20, The method according to claim 19, wherein said deriving further comprises: calculating feature orientations for points in the distribution by using height values of

neighboring points to find approximate directions of approximate greatest change in the height field, Migdal calculates feature orientations for points in the distribution using height values and places the new faces where the height is the greatest so the change in height is the greatest (FIG 3b, element 104). And adding to the distribution points near extrema and features of the height field. Migdal adds points at extrema and features of the height field (FIG 3c, elements 102, 103, and 104).

31. In regard to claim 21, The method according to claim 20, further comprising: identifying borders of features in the height field and using the borders to constrain a triangulation of the distribution of points. Migdal identifies the contour border of features by ordering points according to their height (column 9, lines 2-5). The triangulation is constrained (column 4, lines 31-38).

32. Claims 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Migdal (5886702) in view of Peterson (5428718), in further view of Immel (6462740).

In regard to claim 22, The method according to claim 19 wherein the distributions comprise grids of points uniformly distributed on the triangles, using sides of triangles as axes of the grid. Migdal and Peterson do not have a grid of points distributed on the triangles using the sides as axes. Migdal uses a barycentric point to calculate displacement (FIG 8b, element 326), but does not say how this point is found. Immel teaches using coordinates in a uniformly distributed grid with the sides used as axes to find the barycentric coordinate (column 9, lines 15-35 and FIG 22). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to

modify Migdal and Peterson to use the sides of triangles as axes for a uniformly distributed grid as taught by Immel because this finds the barycentric coordinate.

33. In regard to claim 23, A method of displacing a surface, comprising: deriving a set of points for triangles in a tessellation of the surface, by creating a grid of points on and in a triangle, calculating height values for points in the grid by sampling a height field, Migdal creates a tessellation of triangles by calculating height values (FIG 8b, element 328). Immel modifies Migdal to use a grid to find the barycentric point in the triangle to measure this distance (Immel, FIG 22). Calculating feature metrics for points in the grid by approximating second derivatives of the points using height values of neighboring points, calculating feature orientations for points in the grid by using height values of neighboring points to approximate discrete gradients in the height field, calculating height values for new points in the triangle that are away from the points in the grid in the directions of the feature orientations, identifying new points that are near extrema and features of the height field by approximating second derivatives of the new points using the height values of the new points, and compiling a set of points comprising grid points and identified new points. Peterson modifies Migdal to use the second derivative to find the slope, or gradient, and locations of maximum curvature, or extrema, because at these locations there is a break in continuity and vertices are needed between segments (column 7, lines 50-63 and column 8, lines 9-19).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William P Lehner whose telephone number is 703-305-0682. The examiner can normally be reached on 8:30 - 5 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman can be reached on 703-305-9798. The fax phone

number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-306-0377.

WPL

H MANCUS
RY EXAMI